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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Andreas Orth

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7278

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DARBY & DARBY P.C.

P.O. BOX 770

Church Street Station

New York, NY 10008-0770

EXAMINER

SINGH, PREM C

ART UNIT

PAPER NUMBER

1797

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/540,073	ORTH ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	PREM C. SINGH	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 26 May 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 June 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/26/2009 has been entered.

### ***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a) because they fail to show "upper orifice end of the central tube [3]" as described in the specification (page 9, lines 1-2). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d).

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "the gas supply tube with an upper orifice" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-10 and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beisswenger et al (US Patent 4,716,856) in view of Lapple et al (US Patent 3,578,798).

5. With respect to claims 1-4, Beisswenger discloses a method of producing solids (solids should necessarily be comprising low temperature coke) (See column 8, lines 20-21) in which granular coal is heated to a temperature of 400 to 1200°C in a fluidized bed reactor (See column 2, lines 30-34; column 4, lines 37-39) by an oxygen-containing

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gas comprising introducing from below a first gas or gas mixture through at least one gas supply tube into a mixing chamber of the fluidized bed reactor (See figure 1 and column 2, lines 33-34; column 5, lines 30-32). Beisswenger further discloses that when particle Froude number is used to define the operating conditions, the following ranges can be determined (See column 2, lines 48-50):

$$0.1 \leq \left(\frac{3}{4}\right) (Fr)^2 (\rho_g / [\rho_k - \rho_g]) \leq 10 \quad (\text{See column 2, lines 51-69}).$$

Beisswenger invention does not specifically disclose the gas supply tube surrounded by a stationary annular fluidized bed. Beisswenger does not appear to specifically disclose entrainment of solids from the stationary annular fluidized bed .

Lapple discloses an improvement in a fluidized bed reactor by providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See column 1, lines 22-29). Lapple also discloses that this arrangement causes increased capability for reaction or heat transfer effects in the fluidized bed (See column 1, lines 35-44). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and improve the design of the reactor by an arrangement as disclosed by Lapple for an enhanced reaction rate and heat transfer.

It is to be noted that Beisswenger invention gives a range of Froude number to define the "operating conditions" (See column 2, line 49). Obviously, the range should necessarily be applicable in the gas supply tube, stationary annular fluidized bed

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(formed due to the modification in the apparatus according to Lapple's disclosure) and in the mixing chamber, as claimed.

6. With respect to claim 5, Beisswenger discloses that solids are discharged from the fluidized bed reactor and separated in a separator and a part of the solids is recirculated to the stationary fluidized bed (See column 3, lines 6-10; column 7, lines 60-62; column 11, lines 22-26).

7. With respect to claim 6, Beisswenger discloses that amount of product stream recirculated to the stationary annular fluidized bed is controlled (See column 7, lines 34-40). Although Beisswenger invention does not specifically disclose control by difference in pressure, it would have been obvious to one skilled in the art to use any suitable method to control the amount of solids, including the pressure differential above the mixing chamber, as claimed.

8. With respect to claims 7 and 8, Beisswenger discloses that coal particles (lignite) less than 3/8 inch (9.5 mm) are used in the fluidized bed reactor as a starting material (See column 11, lines 5-10). Lignite is known to those skilled in the art as a highly volatile coal.

9. With respect to claims 9 and 10, Beisswenger discloses that the fluidizing gas supplied to the fluidized bed reactor is an oxygen-rich air supplied under super

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atmospheric pressure, preferably up to  $20 \text{ kg/cm}^2$  above atmospheric pressure (See column 6, lines 27-33).

10. With respect to claims 14-16, Beisswenger discloses a plant for producing solids (should necessarily be comprising low temperature coke) (See column 8, lines 20-21) by the method as discussed under claim 1, comprising a fluidized bed reactor with a gas supply tube, wherein the gas supply tube entrains solids from a fluidized bed (See figure 1 and column 12, lines 29-56).

Beisswenger invention does not specifically disclose an annular fluidized bed which surrounds the gas supply tube.

Lapple discloses an improved fluidized bed reactor by providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See column 1, lines 22-29). Lapple also discloses that this arrangement causes increased capability for reaction or heat transfer effects in the fluidized bed (See column 1, lines 35-44). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40). Lapple shows a mixing chamber located above the upper end of the gas supply tube (See figure 1).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and improve the plant design by a central tube arrangement as disclosed by Lapple for an enhanced reaction rate and heat transfer. This arrangement will provide an annular fluidized bed surrounding the gas supply tube,



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wherein the gas supply tube is centrally located with reference to the cross sectional area of the fluidized bed reactor (See Beisswenger: figure 1 and Lapple: figure 1) and wherein the gas flowing through the gas supply tube entrains solids from the stationary annular fluidized bed into the mixing chamber when passing through the upper nozzle region of the gas supply tube (See See Beisswenger: figure 1; column 7, lines 17-20, 24-26; column 12, lines 29-56 and Lapple: figure 1). It is to be noted that Beisswenger uses a nozzle which is functionally similar to the claimed orifice region.

11. With respect to claim 17, Beisswenger discloses a separator (20, 24) downstream of the fluidized bed reactor of the plant for separating solids which has a solids return conduit (28) leading to the fluidized bed reactor (18) (See figure 1).

12. With respect to claim 18, Lapple discloses that in the annular chamber (16) of the fluidized bed reactor (10) a gas distributor (31) is provided which divides the annular chamber into an upper fluidized bed region (17) and a lower gas distribution chamber (30) and the gas distributor chamber is connected with a supply conduit (32) for fluidizing gas (See figure 1).

13. With respect to claim 19, Beisswenger discloses, "An air preheater can also be employed to partially recover the heat contained in the flue gas" (Column 7, lines 57-59). Obviously, Beisswenger is suggesting to use a heat preheater (upstream of the fluidized bed reactor). Thus, it would have been obvious to one skilled in the art at the

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time of invention to modify Beisswenger invention by using a heat exchanger upstream of the fluidized bed reactor to preheat the fluidizing air by hot flue gases and make the plant more economical. It is also to be noted that flue gases contain some fine coal particles not separated in the cyclone separator (20, 24) (See column 7, lines 51-57). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention by using a separator to further clean the flue gas coming out from the heat exchanger before exhausting to atmosphere.

14. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beisswenger et al (US Patent 4,716,856) in view of Lapple et al (US Patent 3,578,798) and further in view of Bresser et al (US Patent 5,560,762).

15. With respect to claims 11-13, Beisswenger discloses use of all kinds of coal, washery refuse, various industrial residues, wood wastes and municipal refuse (See column 6, lines 39-43), however, the invention does not appear to specifically disclose use of iron ore.

Bresser discloses a process of heat treatment of iron ore in granular form in a fluidized bed reactor under temperature and pressure conditions similar to Beisswenger invention (See column 1, lines 34-50; column 2, lines 15-49; column 7, lines 5-21). Bresser also discloses that particle Froude number for the process is also in a range similar to Beisswenger (See column 3, lines 1-24). Bresser further discloses that all

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coals, carbon containing minerals, washery refuse etc. may be used as carbon containing material (See column 7, lines 5-8).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and blend iron ore with the coal feed in the fluidized bed reactor and produce coke as well as heat treated iron ore in the same plant and make the process more flexible and useful. It would also have been obvious to specify the weight ratio of iron to carbon in the product for proper characterization of the products produced in the fluidized bed reactor.

### ***Response to Arguments***

16. Applicant's arguments filed 04/27/2009 have been fully considered but they are not persuasive.

17. In the arguments on page 7/10 (paragraph 2-3), the Applicant argues that neither Beisswenger nor Lapple teach or suggest adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30., as recited in claim 1. In contrast, Beisswenger merely describes a typical Froude number range for a circulating fluidized bed reactor that may define overall reactor operating conditions. Regarding Lapple, that reference does not

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teach Froude numbers at all. Lapple moreover recites an annular reactor. A person of ordinary skill in the art would therefore not have attempted to apply the Froude numbers of Beisswenger relating to circulating fluidized bed reactor to control the annular fluidized bed reactor of Lapple.

The Applicant's argument is not persuasive because Beisswenger discloses that when particle Froude number is used to define the operating conditions, the following ranges can be determined (See column 2, lines 48-69). Obviously, Beisswenger is controlling the reactor conditions using the particle Froude number, as claimed.

Lapple discloses a stationary annular fluidized bed which is an improvement in a fluidized bed reactor by providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See column 1, lines 22-29). Lapple also discloses that this arrangement causes increased capability for reaction or heat transfer effects in the fluidized bed (See column 1, lines 35-44). It is also to be noted that Froude number is a function of gas velocity, gas density and density of solid particles (See equation, column 2, lines 51-69). Obviously, the value of Froude number is expected to be in a similar range in Beisswenger and Lapple processes.

18. In the arguments on page 7/10 (paragraph 4) and page 8/10 (paragraph 1), the Applicant argues that independent claims 1 and 14 have now been amended so as to recite introducing from below a first gas or gas mixture through at least one gas supply tube with an upper orifice into a mixing chamber of the fluidized-bed reactor "so as to

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entrain solids from a stationary annular fluidized bed into the mixing chamber when passing through the upper orifice" of the at least one gas supply tube, and that the "at least one gas supply tube is at least partly surrounded by a stationary annular fluidized bed extending beyond the upper orifice" of the gas supply tube.

The Applicant's argument is not persuasive because as discussed in the Office action above, Lapple discloses providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See figure 1; column 1, lines 22-29). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40).

19. In the arguments on page 8/10 (paragraph 2-3), the Applicant argues that neither Beisswenger nor Lapple teach or suggest entraining solids from a stationary annular fluidized bed into the mixing chamber by a first gas or gas mixture passing through an upper orifice of at least one gas supply tube where the supply tube is at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice of the gas supply tube, as recited in claims 1 and 14. In contrast, Lapple describes an annular reactor where the tube 14 extends beyond the fluidized bed 17. See Lapple, Fig. 1. The extension of tube 14 beyond the fluidized bed 17 in Lapple prevents solids in the fluidized bed 17 from being entrained by the gas in tube 14. Lapple moreover teaches *away* from the claimed design by describing that its solids are only entrained by the gas after being discharged into tube 14 through tangentially arranged passages 36 in

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tube 14. See Lapple, column 2, lines 44-58, and Fig. 1. Regarding Beisswenger, that reference does not teach an annular fluidized bed reactor at all. Because each of Beisswenger and Lapple are missing at least the recited stationary annular fluidized bed extending beyond the upper orifice of the gas supply tube feature recited in claims 1 and 14, it is respectfully submitted that any combination of Beisswenger and Lapple, to the extent proper, could not render claims 1 or 14, or any of their respective dependent claims, obvious.

The Applicant's argument is not persuasive because Lapple discloses a central tube [14] and the fluidized bed extending beyond the tube, similar to the claimed invention (See figure 1). Lapple's method of entrainment of solids in the gas passing through the tube is by passing of the solids through nozzles [36], which is similar to the Applicant's claimed process of entrainment by passing of solids through the orifice in the gas supply tube.

20. In the arguments on page 9/10 (paragraph 2), with respect to claims 11-13, the Applicant argues that Beisswenger and Lapple fail to teach and suggest at least the features of "adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30," a reactor where "one gas supply tube is at least partly surrounded by a stationary annular fluidized bed extending beyond the "upper orifice of the gas supply tube" and

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withdrawing iron ore and low-temperature coke from the reactor "through an upper duct together with the gas." Bresser does not cure this defect. Therefore, a combination of Beisswenger in view of Lapple and further in view of Bresser, to the extent proper, could not render claim 1 or its dependent claims 11-13 obvious.

The Applicant's argument is not persuasive because combined teachings of Beisswenger and Lapple disclose Froude number to define the operating conditions in the fluidized bed (See Beisswenger, column 2, lines 48-69). Thus, it is expected that the Froude number in the modified Beisswenger process should necessarily be in a range including as claimed by the Applicant (See Office action above under claim 1). Bresser teaches processing of iron ore under similar operating conditions as Beisswenger. Bresser also defines the operating conditions by means of Froude number similar to Beisswenger (See Bresser, column 2, lines 50-67; column 3, lines 1-24).

21. In conclusion, the claimed invention is *prima facie* obvious over Beisswenger in view of Lapple and Bresser.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS 062909

/In Suk Bullock/  
Primary Examiner, Art Unit 1797